

Element 1g - Barrier Effects on SWP and CVP Salvage (2010)

This annual summary report of State Water Project (SWP) and Central Valley Project (CVP) salvage is included in the South Delta Temporary Barriers Project (TBP) annual monitoring report with the intention of evaluating whether or not seasonal temporary fish barriers reduce fishery impacts by reducing entrainment of fish at the Skinner (SWP) and Tracy (CVP) fish facilities. Of particular interest in this chapter is the spring Head of Old River Barrier (HORB). This barrier is primarily intended to increase San Joaquin River Chinook salmon smolt survival on the assumption that smolts entering Old River and eventually being entrained in the SWP and CVP fish facilities decreases their likelihood of survival. The spring HORB was not installed during the 2010 season; instead a non-physical barrier (NPB) was installed and tested for effectiveness.

The use of salvage data to indicate the effectiveness of the spring HORB has always been difficult to ascertain due to the complexities involved with analyzing a multitude of variables including export rates, local population dynamics of fishes in the South Delta and Clifton Court Forebay, Delta hydrodynamics, barrier influences of the south Delta flow, etc. Another weakness of analyzing a variable such as salvage is our inability to accurately determine causal relationships between variables. In addition to these factors, the use of the NPB may have a different effect than the traditional spring HORB physical barrier. As a result of these complexities, this section focuses solely on presenting the available data regarding changes in temporary barrier operations, project exports, and listed species salvaged at both the SWP and CVP facilities during 2010.

Data Collection

Skinner and Tracy salvage data were downloaded from the California Department of Fish and Game (DFG) Bay-Delta Office ftp Web site (<ftp://ftp.delta.dfg.ca.gov>). Project water exports were provided by California Department of Water Resources (DWR) staff from the Division of Operations and Maintenance, State Water Project Operations Control Branch, Operations Scheduling Section. Barrier operations were obtained from the Temporary Barriers Project “Weekly Updates” and “Schedule of Operations,” which are posted on the DWR South Delta Branch website (<http://sdelta.water.ca.gov>).

While all the temporary barriers are noted in Table 3-1, the spring HORB is the only barrier traditionally focused on in this chapter, due to its intended purpose as a fish barrier. The remaining barriers serve as agricultural barriers. According to the 2008 Biological Opinion created by NOAA, “The Head of Old River Barrier is designed to improve migration conditions for Central Valley fall-run Chinook salmon originating in the San Joaquin River watershed during adult and juvenile migrations (i.e., fall and spring) by ‘blocking’ migratory movements into the Old River channel from the mainstem San Joaquin River.” However, the NPB was installed in 2009 and 2010 in place of the traditional spring HORB to serve the same function, as a fish barrier.

Temporary barrier installations for 2010 were completed as follows:

Table 3-1. Temporary Barrier Installations, 2010

Barriers	Installation started	Closure	Complete removal
Non-physical barrier	April 7, 2010	Installation Complete	June 16, 2010
Middle River	May 10, 2010	May 24, 2010	Nov 2, 2010
Old River near Tracy	May 10, 2010	June 3, 2010	Nov 4, 2010
Grantline Canal	June 16, 2010	July 7, 2010	Nov 19, 2010
Fall Head of Old River	Not installed 2010	Not installed 2010	Not installed 2010

Methods

In the study “Losses of Sacramento River Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento-San Joaquin Delta” (Kimmerer 2008), correlative analyses suggest that the proportion of fish salvaged increased with export flow. Due to this possible correlation between salvage counts and the amount of water exported, graphs of daily water export data and fish salvage data are plotted for listed species entrained at either the SWP or the CVP facility (Figures 3-2 through 3-10). Listed fish species include: Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss irideus*), splittail (*Pogonichthys macrolepidotus*), longfin smelt (*Spirinchus thaleichthys*), and delta smelt (*Hypomesus transpacificus* (see Table 3-2 for listing status). Chinook salmon has various Environmentally Significant Units (ESUs) listed under both the Federal and California Endangered Species Acts. However, salvage data does not differentiate between these ESUs; and data is thus presented by species.

Table 3-2. Special Status Species

Common name	Scientific name	FESA status*	CESA status*	DFG status*
Chinook Salmon-Central Valley fall/late fall-run ESU	<i>Oncorhynchus tshawytscha</i>	None	None	SSC
Chinook Salmon-Central Valley spring-run ESU	<i>Oncorhynchus tshawytscha</i>	T	T	None
Chinook Salmon-Sacramento River winter-run ESU	<i>Oncorhynchus tshawytscha</i>	E	E	None
steelhead-Central Valley ESU	<i>Oncorhynchus mykiss irideus</i>	T	None	None
Sacramento splittail	<i>Pogonichthys macrolepidotus</i>	None	None	SSC
longfin smelt	<i>Spirinchus thaleichthys</i>	None	T	SSC
delta smelt	<i>Hypomesus transpacificus</i>	T	T	None

*T= Threatened, E= Endangered, SSC= Species of Special Concern

Fish Salvage Concerns

An examination of fish salvage as a sample of entrained fishes is complicated due to differences in how fish species and age groups respond to environmental conditions. The SWP and CVP fish facilities are not designed to effectively sample all fish equally. Salvage efficiency is related to the size of the fish, species, and age groups. In addition, due to the inherent variability in sizes of fish populations from year

to year, significantly large proportions of stocks may be entrained because of their inability to escape the pumps' zone of influence. For example due to their size, larval fishes are especially susceptible to entrainment.

Differences in SWP and CVP fish collection configurations complicate a comparison of the daily project salvage data relative to position of species in the south Delta. The simple presence of Clifton Court Forebay prior to entry into the SWP fish facility may directly or indirectly alter salvage estimates at this facility. In addition, the decline of Delta fish populations in general could be confounding factors in this qualitative analysis.

The data for Chinook salvage would be more likely to show any noticeable trends resulting from use of temporary barriers over time than salvage counts for other species, due to the NPB's proposed direct intention to decrease the amount of Chinook entrained at the fish facilities. The data collected in 2010 using the NPB should be considered separately from past spring HORB data due to the change in technique and inherent unknown variation in effectiveness.

Salvage Data

As mentioned in the previous section, Fish Salvage Concerns, there are complications in drawing specific conclusions regarding the effect of the temporary barriers on fish populations using the available data. Water export fluctuation (both natural and human-induced) and the inherent variability in fish population dynamics from year to year, regardless of temporary barriers, make it difficult to accurately assess the data and make correlations. Therefore, export and salvage data are presented for documentation purposes only.

Total salvage at the SWP salvage facility for all fish species was 266,649 in 2010. Chinook salmon comprised 0.315% of the total, steelhead comprised 0.202% of the total, splittail comprised 2.128% of the total, longfin smelt comprised 0.0004%, and delta smelt comprised 0.002% of the total. All together, the 5 listed species taken into consideration in this chapter comprised 2.647% of the total fish salvage at the SWP salvage facility.

Total salvage at the CVP salvage facility for all fish species was 233,869 in 2010. Chinook salmon comprised 0.866% of the total, steelhead comprised 0.416% of the total, splittail comprised 17.257% of the total, longfin smelt comprised 0.003%, and delta smelt comprised 0.010% of the total. All together, the 5 listed species taken into consideration in this chapter comprised 18.553% of the total fish salvage at the CVP salvage facility.

Table 3-3. Summary of Figures

Figure	Location	Species
3-1	SWP	Chinook salmon
3-2	CVP	Chinook salmon
3-3	SWP	Steelhead
3-4	CVP	Steelhead
3-5	SWP	Splittail
3-6	CVP	Splittail
3-7	SWP	Longfin smelt
3-8	CVP	Longfin smelt
3-9	SWP	Delta smelt
3-10	CVP	Delta smelt

In comparison, total salvage at SWP and CVP for 2009 was much higher, 837150.6 and 859669.4 respectively. It should also be noted that splittail salvage was much higher in 2010 than in 2009. In 2009, splittail comprised 0.169% of total SWP salvage and 0.163% of total CVP salvage. Whereas, in 2010 splittail comprised 2.128% of total salvage and 17.257% of total salvage.

Daily water export and fish salvage data were presented in graphical form (Figures 3-3 through 3-10) using percent relative exports and listed fish species for both the SWP and the CVP. These figures are summarized in Table 3-3.

Recommendations

It appears that significant correlations between fish species densities and changes in water project hydrodynamics are complicated by variability of fish sampling and yearly water fluctuations. Due to this uncontrolled variability, the data collected for this monitoring report do not provide the ability to draw accurate conclusions. The use of this data for analysis would be aided by the inclusion of ecological data on fish populations in the Delta. This type of data may be available from additional research activities including DWR's Interagency Ecological Program (IEP) studies and the Operating Criteria and Plan (OCAP) for CVP and SWP studies. However, population estimates can be highly variable due to some of the same complexities that hinder our analyses of salvage data. The recent implementation of the NPB also adds or changes many variables in this analysis. Research regarding the effectiveness of the NPB may aid in the analysis of barrier effects on fish salvage.

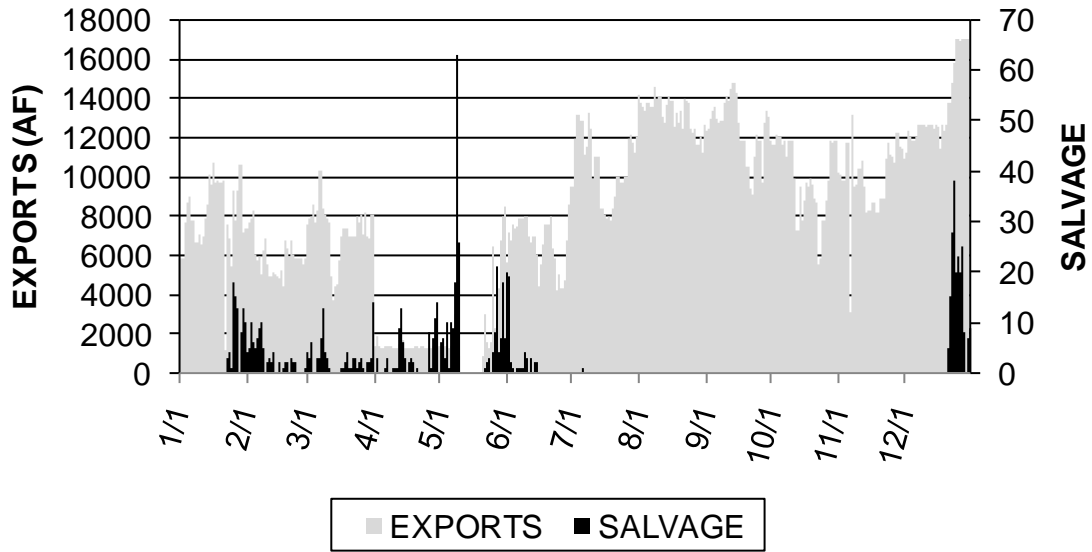


Figure 3-1. 2010 SWP Chinook Salvage

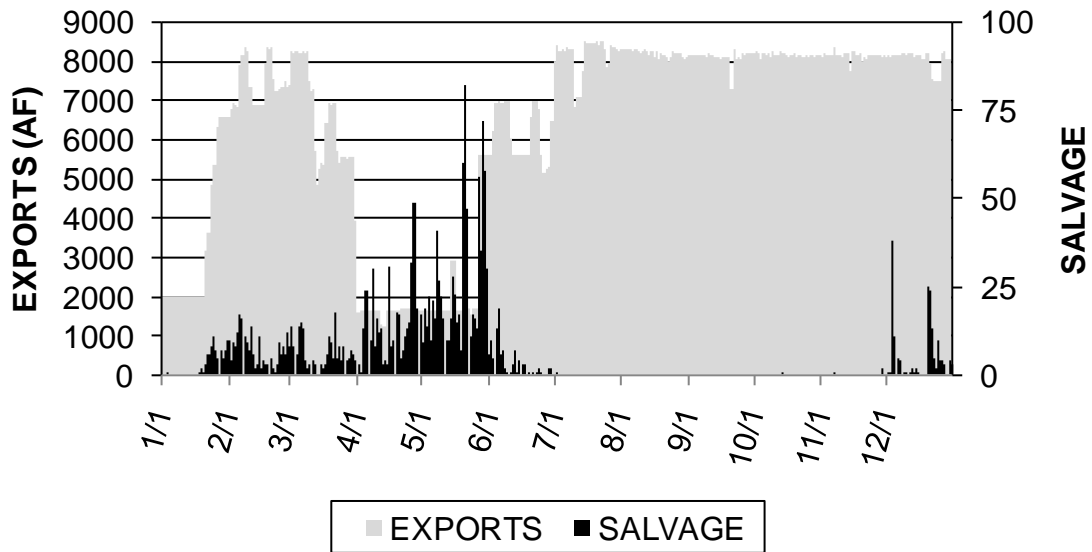


Figure 3-2. 2010 CVP Chinook Salvage

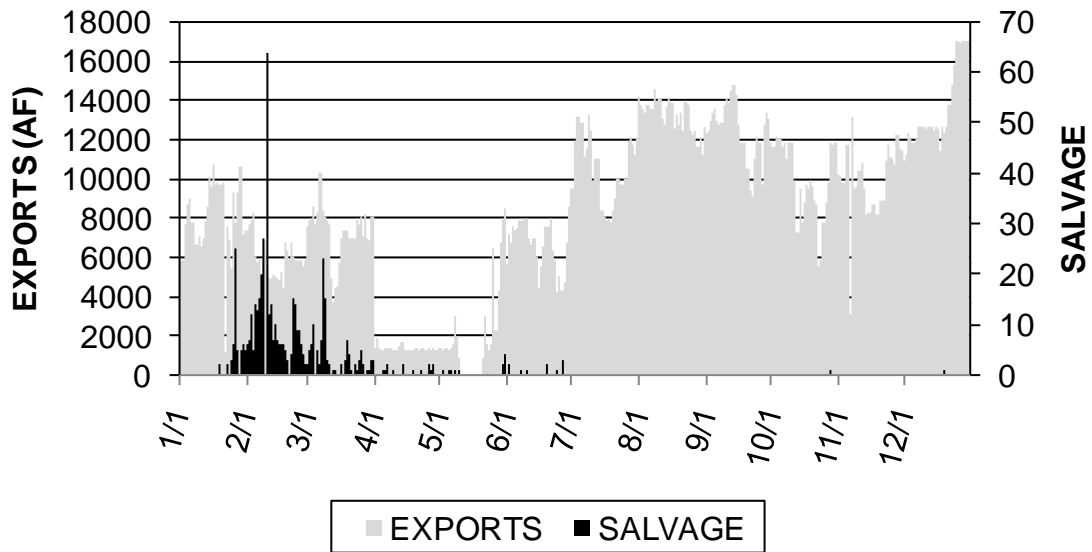


Figure 3-3. 2010 SWP Steelhead Salvage

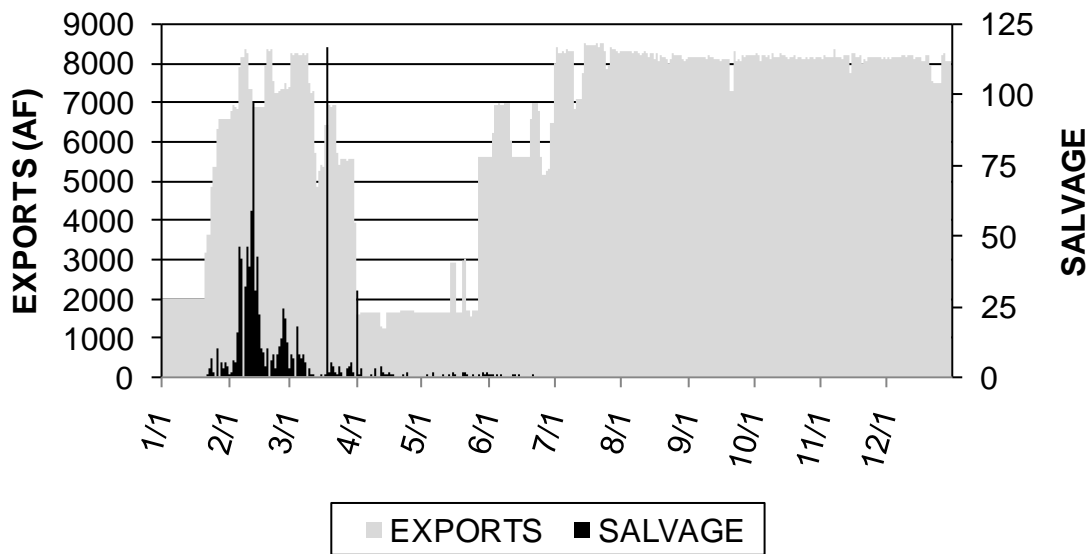


Figure 3-4. 2010 CVP Steelhead Salvage

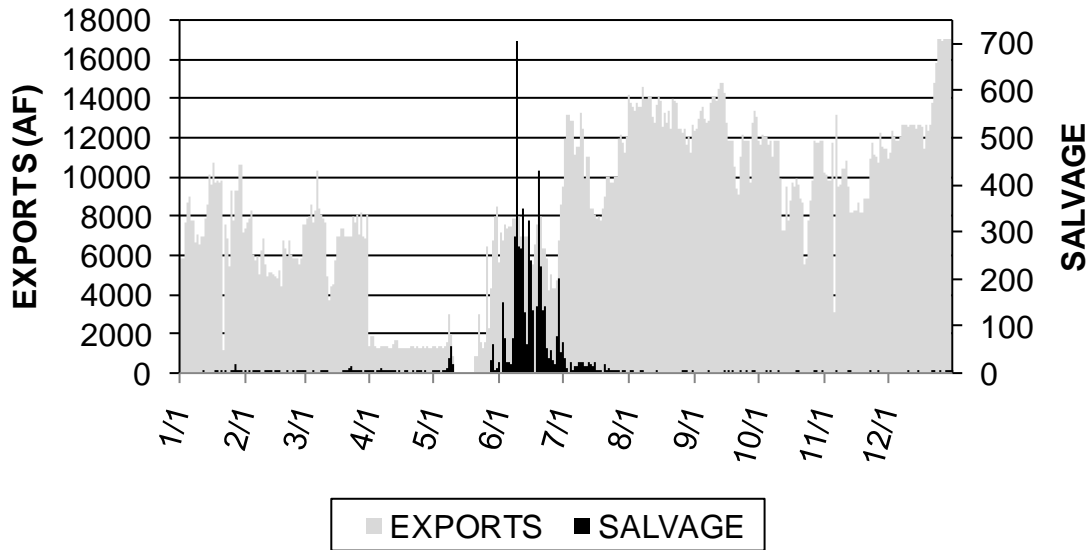


Figure 3-5. 2010 SWP Splittail Salvage

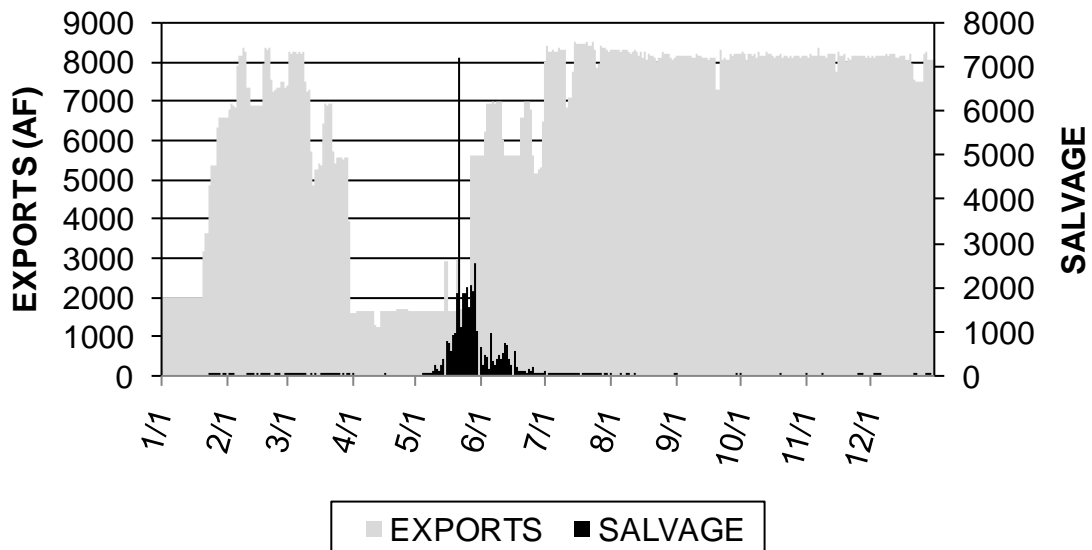


Figure 3-6. 2010 CVP Splittail Salvage

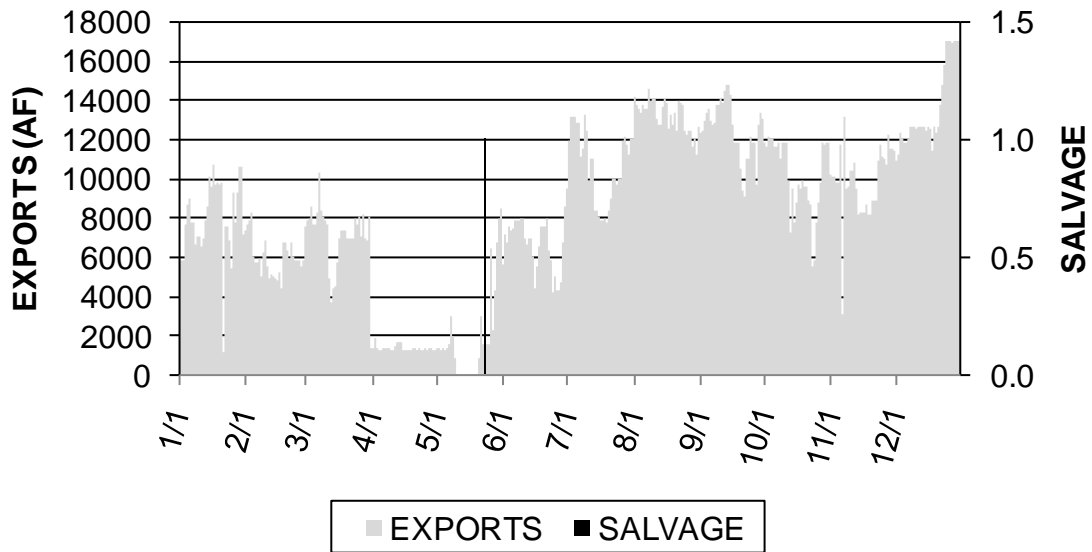


Figure 3-7. 2010 SWP Longfin Smelt Salvage

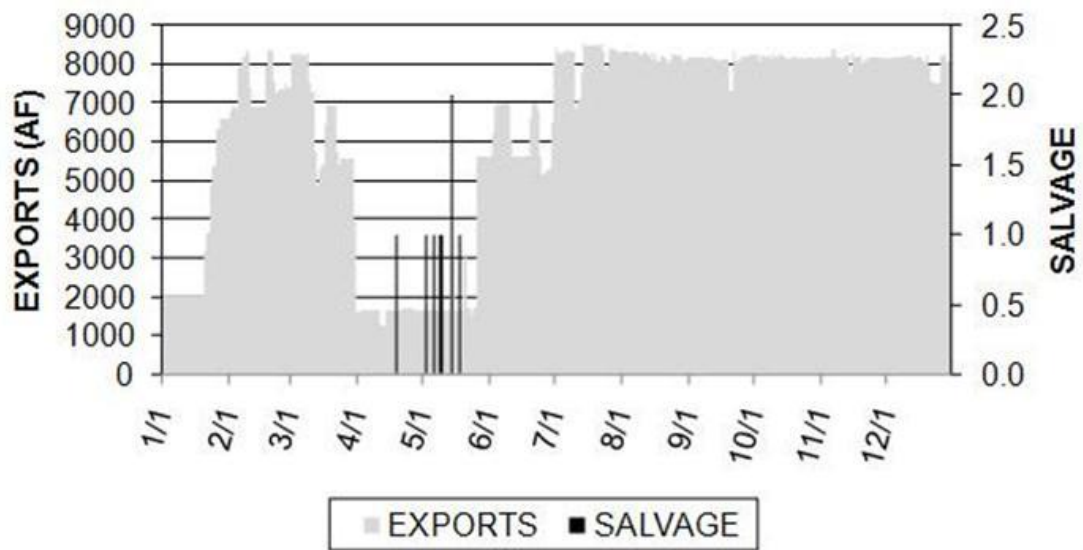


Figure 3-8. 2010 CVP Longfin Smelt Salvage

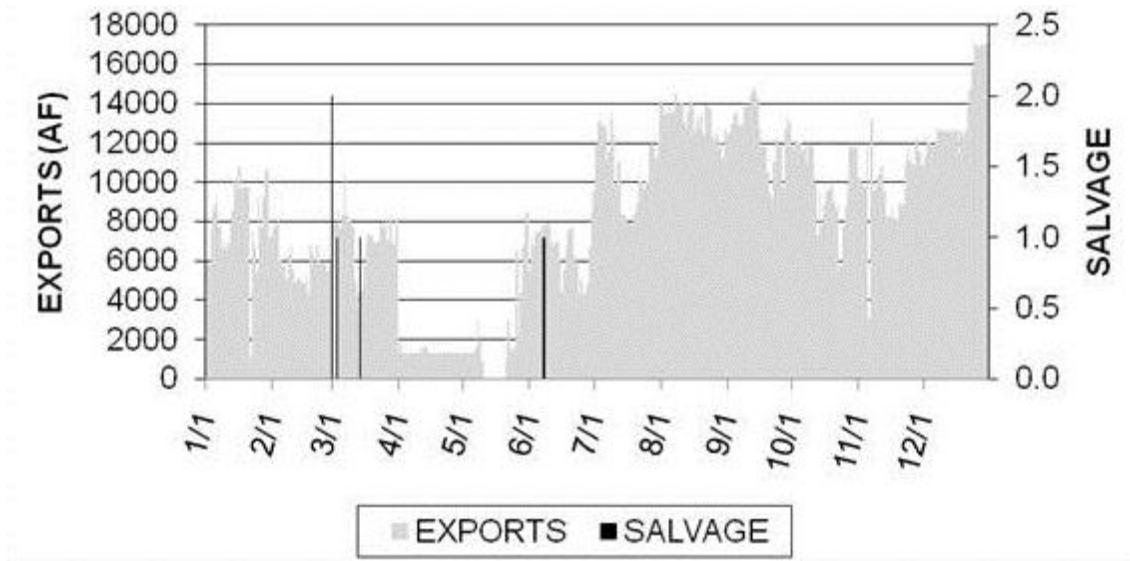


Figure 3-9. 2010 SWP Delta Smelt Salvage

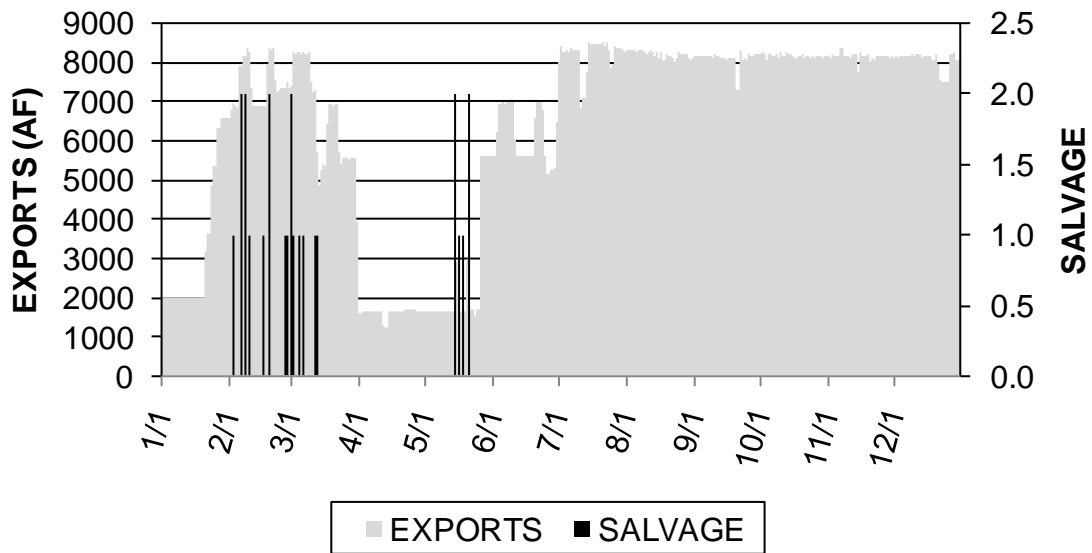


Figure 0-10. 2010 CVP Delta Smelt Salvage

References

- California Department of Water Resources (DWR). 2002. 2002 South Delta Temporary Barriers Monitoring Report.
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